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(54) A method of stabilising pile yarns of tufted, woven or knitted pile products.

(57) A method of improving the tuft definition and appearance retention of yarn pile fabrics is disclosed, which comprises stabilising real twist in the pile yarn after insertion of real twist by bonding together some or all of the discontinuous fibres of continuous filaments within the yarn.

Pile fabrics are disclosed made by a process incorporating this method.

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definition and appearance retention of pile fabrics which includes (a) dispersing a bonding agent in fibrous or filament form between the discontinuous fibres or continuous filaments of a twisted pile yarn during a manufacturing process, (b) at a selected stage in the manufacturing process rendering adhesive all or part of the bonding agent so that after it bonds, the yarn structure is stabilised by inter-fibre bonding substantially within the yarn tufts or loops of the pile fabric.

According to the present invention at least some of the pile yarn in a fabric, carpet or rug are structured such that some or all of the fibres, within the pile yarn are bonded together intermittently and randomly substantially throughout the length of the pile tuft or loop formed from the pile yarn.

Preferably the bonding agent is a heat sensitive fibre or filament so that by temporarily raising the temperature of the manufacturing process sufficiently to melt wholly or partially at least part of the bonding agent, such that after cooling the pile and yarn structure is stabilised by inter-fibre bonding within the structure.

The method is applicable to any twisted yarn structure containing continuous or discontinuous fibres and to twisted yarn structures containing continuous filaments.

The bonding agent can consist of bonding fibres (known to the industry) of which at least part of the surface can be melted. The wholly or partially fusible fibres bond to each other or to contiguous non-adhesive fibres which are in the yarn. The term non-adhesive fibres as used herein means fibres which remain non-adhesive at and below the temperature required for bonding. The bonding fibres can be bicomponent fibres in which one component melts and becomes adhesive at a lower temperature than does the other component. The component having the lower melt temperature comprises part of or all of the surface of the bonding fibre. Alternatively, the bonding fibres can be mono-component types in which the melting temperature is similar throughout the fibre. The non-adhesive fibre present can be a natural, man-made or synthetic fibre which does not melt at the temperature required for bonding. If the non-adhesive fibre is in continuous filament form then the bonding fibre can for manufacturing convenience be in continuous filament form.

In use with a bonding agent consisting of bonding fibres, the dispersion of the bonding fibres among the non-adhesive fibres can be achieved by conventional textile blending techniques. The blend of bonding and non-adhesive fibres may be processed to yarn form by any of the following fibre-to-yarn manufacturing techniques, woollen (condenser) spinning, semi-worsted spinning, worsted spinning, wrap spinning, friction spinning, open-end spinning, cotton spinning or modified cotton spinning. When the bonding and non-adhesive components are in continuous filament form, the dispersion of one among the other can be achieved by any known fluid-jet intermingling technique.

The application of heat to effect bonding may be most beneficially carried out before fabric manufacture during production of a cut-pile fabric and before or after manufacture of a loop-pile fabric. The heating medium can most efficiently be a hot fluid such as air or steam.

Further aspects of the invention which should be considered in all its novel applications will become apparent from the following examples.

EXAMPLE 1

In this example of the invention, a 2-fold (i.e. comprised of two singles yarns plied together) woollen spun pile yarn containing 85% wool fibres and 15% of a bicomponent polyester bonding fibre was bonded by a heat treatment before tufting into cut-pile carpet. The bonding fibre was 4 denier 51 mm Melty Type 4080 manufactured by Unitika Limited, 4-68 Kitakyutaro-Machi, Higashi-ku, Osaka, Japan. Blending of the wool and bonding fibre was carried out by conventional stack or sandwich blending followed by two passages of the fibres through a wool opening machine and by conventional woollen (condenser) carding. Following conventional woollen spinning and two-folding, the R500/2 tex yarn produced was bonded by heat-treatment in hank-form in a steam autoclave at 140 degrees C for 30 seconds. The singles yarn twist was 170 turns per metre (tpm) and two levels of folding twist were used to produce (a) a sample containing 160 tpm folding twist and (b) a sample containing 120 tpm folding twist.

Testing and subjective examination of the bonded yarn and a carpet manufactured from the yarn gave the following results considered by the applicants to be illustrative of the benefits of the invention.

1. When snippets (12mm lengths) of the bonded yarn were tested on a WRONZ Set Tester at 50 degrees C for 500 cycles using a 12mm orifice size, no snippet breakdown occurred, indicating a very high degree of stability.

2. When tufts of yarn were withdrawn from the backing (before application of latex to the backing) and subjected to 60 seconds in an air turbulence chamber, the bonded yarn tufts remained intact, whereas

Yarns made and stabilised as in Example 2 were tufted to a 10 mm pile height, 5/32 inch gauge, loop-pile carpet construction with 360 stitches per metre. After an instrumental simulated carpet wear test (Tetrapod test, as in Example 1), the measured fibre loss was found to be:

0% bonding fibre	1.87grams/square metre
5% bonding fibre	0.34grams/square metre
10% bonding fibre	no detectable loss
15% bonding fibre	no detectable loss,

indicating that pile bonding reduced fibre loss in the simulated wear conditions.

EXAMPLE 4

Two-fold yarns of R500/2 tex with 170 turns per metre singles twist and 140 turns per metre folding twist (in the opposite direction of twisting), but otherwise similar to the yarns described in Example 2, were tufted to loop-pile carpet as described in Example 3. After an instrumental simulated wear test the measured fibre loss was found to be:

0% bonding fibre	2.21 grams/square metre
5% bonding fibre	0.17 grams/square metre
10% bonding fibre	no detectable loss
15% bonding fibre	no detectable loss,

indicating that pile bonding decreased fibre loss in the simulated wear conditions.

EXAMPLE 5

Two fold yarns made and stabilised as in Example 4 were tufted into cut-pile carpet as described in Example 2. Testing of yarn wet stabiity, as in Example 1, showed that the proportion of yarn snippets which disintegrated during the test was:

0% bonding fibre	100%
5% bonding fibre	58%
10% bonding fibre	13%
15% bonding fibre	1%

which indicated that bonding increased the yarn wet stability.

When samples of the carpets were compared by 20 judges, each making independent assessments, the tuft definition was found to increase as the proportion of bonding fibre increased, for new, unworn carpets. The tuft definition was found to be greater at 10% and 15% bonding fibre content than at 5% bonding fibre content, which in turn was greater than that of the unbonded 100% wool yarn, (a) for carpet samples which had been worn and soiled in a floor trial, (b) for carpet samples which had been steam cleaned after wear and soiling in a floor trial, and (c) for carpet samples which had been rotary-brush shampoo cleaned after wear and soiling in a floor trial.

EXAMPLE 6

An objective measure of tuft definition, using an image analysis technique, and indicated in terms of a parameter (defined in WRONZ Communication C105, 1987, as Local Intensity Variability Mean, or LIV

showed that the bond-stabilised carpet pile lost less tuft definition than the autoclave-set luu% wool yarn (a) after wear and soiling in a floor trial, (b) after steam-cleaning following the floor trial and (c) after rotary-brush shampoo cleaning following the floor trial.

When subjected to a test for loss of fibre (termed fibre shedding), which test consisted of continuous abrasion and vacuuming for 2 hours under a traversing vacuum slot pressing upon the carpet pile, the bond-stabilised pile carpet lost less fibre than the autoclave-set 100% wool pile carpet.

The bond-stabilised pile carpet was also found to have better cover (that is, less space between the tufts), a more upright pile and displayed less thickness loss when worn than the autoclave-set 100% wool yarn.

EXAMPLE 9

Singles 255 tex woollen-spun yarn containing 9% bicomponent polyester bonding fibre and 91% carpet wool and having 190 turns per metre twist was twisted to form three two-fold yarns of 510 tex having respectively 150, 180 and 210 turns per metre folding twist. The yarns were autoclave-bonded at 131 degrees C for 20 seconds and were then tufted to 14 mm pile height carpet in 1/8 inch gauge cut-pile construction with 360 stitches per metre.

The unbacked carpets were beck-dyed (alternatively termed winch-dyed, a process known to the trade) with disperse and acid-levelling dyestuffs colouring both polyester and wool components of the carpets. The beck-dyeing process is known to the industry to require a high degree of pile yarn stability to resist the tendency of pile tufts to lose definition during the process and consequently to form a visually undesirable texture.

The resultant carpets which had bond-stabilised pile had excellent tuft definition, which was as good as or better than that of carpets of the same construction containing chemically set 100% wool yarns of the same construction.

Thus by this invention there is provided a method of stabilising the pile structure of a tufted, woven or knitted yarn pile product.

Particular examples of the invention have been described herein and it is envisaged that improvements and modifications can take place without departing from the scope of the appended claims.

Claims

1. A method of improving the tuft definition and appearance retention of yarn pile fabrics, including carpets, by stabilizing real twist in the pile yarn by bonding together some or all of the discontinuous fibres or continuous filaments within the yarn, which bonding is effected in a separate process subsequent to the process of insertion of real twist into the yarn.

2. A method of improving the tuft definition and appearance retention of yarn pile fabrics according to Claim 1, which includes:

(a) dispersing or blending a bonding agent in fibre or filament form among non-adhesive fibres or filaments to be formed into the pile yarn,

(b) forming either a singles yarn containing real twist or optionally forming a plied yarn by twisting 2 or more singles yarns together,

(c) after the pile yarn has been formed and optionally plied and before a pile fabric is manufactured, rendering adhesive all or part of the bonding agent, so that after it bonds the twisted yarn structure is stabilised by inter-fibre bonding.

3. A method of stabilising the pile of cut-pile fabrics according to Claim 1 or Claim 2 in which the bonding agent consists of bonding fibres, at least part of the surface of which can be rendered adhesive by heating to cause melting, and in which the bonding agent comprises between 3% and 25% of the bond-stabilised pile yarn.

4. A method of stabilising the pile of cut-pile and loop-pile fabrics according to any one of the preceding Claims, in which the pile yarn contains non-adhesive fibres, which can be natural fibres, man-made or synthetic fibres or any mixture of natural, man-made or synthetic fibres, as well as bonding agent.

5. A method of stabilising the pile of cut-pile and loop-pile fabrics according to claim 4, in which the pile yarn is constructed according to woollen-spun, semi-worsted-spun, worsted-spun, wrap-spun, friction-spun, open-end spun, cotton-spun or modified cotton-spun processing techniques.

6. A pile fabric or carpet, constructed according to the method of any of the preceding claims.

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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 8809

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
E	GB-A-2 205 116 (WOOL RESEARCH ORGANISATION OF NEW ZEALAND INC.) * Claims 1-9 *	1-9	D 02 G 3/40 D 02 G 3/44
X	WO-A-8 803 969 (ALLIED CORP.) * Page 3, line 14 - page 5, line 34 *	1-3,6-9	
Y		4,5	
A	US-A-2 252 999 (R. WALLACH) * Page 1, column 1, line 47 - column 2, line 17 *	1,2,3,6	
Y	* Page 2, column 1, lines 6-34 *	4,5	
A	US-A-2 253 000 (C.S. FRANCIS) * Page 3, column 1, lines 7-9; claim 1; page 2, column 1, lines 62-65 *	1,2,6	
Y	* Page 1, column 1, lines 41-46; page 2, column 1, lines 8-29 *	4	
Y	* Page 2, column 1, lines 54-60 *	5	
A	GB-A- 568 675 (SYLVANIA INDUSTRIAL CORP.) * Claim 1 *	1,2,6	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	* Page 3, lines 51-59 *	3	D 02 G
Y	* Page 2, line 39 - page 3, line 25 *	4	
A	CH-A- 220 994 (SYLVANIA INDUSTRIAL CORP.) * Page 2, lines 26-65; claim 1 *	1,2,3,6	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24-04-1989	HOEFER W.D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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